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NERVE-BLOCKING OF THE STELLATE GANGLION IN PLEUROPULMONARY SHOCK

«Блокада звездчатого узла при плевропульмональном шоке»

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Over a period of many years, scientific thought has been tenaciously laboring on the problem of the regulation of vital processes by the vegetative nervous syste . However, no final solution has been found for this problem, and further work on it is badly needed. One thing may be said, and that is that there is not a single pathological process in the human organism which goes on without vegetative innervation having a part in it.

The study of the vegetative nervous system is a considerable help to us in orienting ourselves as regards the complicated pathological states of the organism, and it opens up for us new paths in connection with the therapeutic processes.

The best way to prevent the development of pleuropulmonary shock or to check its effects is novocaine blocking of the stellate ganglion, since from it radiate the sympathetic nerve-fibers forming the plexi of the heart, the bronchi and the parietal pleura. Furthermore, through this ganglion there pass the impulses from the cervical ganglia, since the latter do not have their own central cells.

The blocking of this ganglion bars the path of pain impulses passing from the thoracic region to the central nervous system, and directly influences the vasomotor and respiratory centers; it lowers the sensitivity of the cerebral cortex and evokes the phenomena of general inhibition. The heart begins to beat more slowly, diastole is not so full, blood-pressure drops, respiration slows down and becomes deeper, pain disappears, along with feelings of apprehension and of constriction of the chest.

The method of blocking the stellate ganglion was first introduced by us in 1941 on the Stalingrad front, in the treatment of 21 cases of pleuropulmonary shock; the method demonstrated its complete effectiveness, and was given the approval of the Surgeon-in-Chief of that front, G.M.GUREVICH. Subsequently, blocking of the stellate ganglion passed into general practice for the whole duration of the Great Fatherland War.

The stellate ganglion lies medially by the spine, deep in the bed formed on the underside by the cupula pleurae, behind by the head of the first rib, and in front by the subclavian artery. However, its position is not unvarying: sometimes it merges with the inferior cervical ganglion and lies higher, above the head of the first rib. Several ways of access to the stellate ganglion have been proposed, from in front, from the side and from behind. SHAMOV describes twelve methods, but at the same time indicates complications which may arise, namely injury to major blood vessels (the subclavian vein and artery and the vertebral artery), injury to the pleura, injury to the arachnoid mater of the spinal cord upon the needle's penetrating into the intervertebral space. The simplest method in our opinion is the following, described in the literature:---

The patient is in a sitting position. The needle is introduced at the height of the spinal process of the first thoracic vertebra, 3 cm to the side of the median line, and is advanced through the clearly felt ligament between the transverse process of the seventh cervical vertebra and the first rib. With the aid of roentgenoscopy we can assure ourselves that the tip of the needle is located at the upper edge of the head of the first rib, whereupon the needle is pushed 1-2 cm deeper. If after the injection of the novocaine Horner's syndrome fails to develop, the needle is withdrawn 1.5 cm and introduced at the lower edge of the neck of the first rib.

We have not been employing roentgenoscopy, since the head of the first rib, our principal orientation-point, may be felt with the needle. As soon as it is felt, we draw the needle back a little and introduce it, not perpendicularly over and under the first rib, but at an angle of 45° to the spine; having made contact with the spine, we withdraw the needle slightly and inject 30 cm^3 of a 0.5% novocaine solution above the head of the first rib, and the same amount below. Physiological solution should be used for the purpose, and it should be warmed slightly.

When the solution penetrates into the region of the stellate ganglion, Horner's syndrome usually appears---miosis, ptosis, exophthalmia of the eye on the same side, flushing of the cheeks and sometimes of the neck, stopping of the nose on the same side, and a fuller pulse in the radial artery.

When the blood-pressure is in a lowered state, it usually rises after the novocaine block; high blood-pressure falls. Horner's syndrome develops in consequence of the connection of the stellate ganglion with the first cervical sympathetic ganglion. In rare cases Horner's syndrome is indistinctly expressed, when the stellate ganglion has a connection with the opposite side.

After administration of the block, the patient is in a state of euphoria, with clearly expressed symptoms of cortical inhibition. Pain as a rule disappears within 3-5 minutes; the

pulse slows down by 15-20 beats per minute and respiration likewise; coughing and chest constriction vanish; the general condition improves.

This type of block has been used by us in 120 wound cases with pleuropulmonary shock, in 117 of which it showed an extraordinary effectiveness. Usually within five minutes the patients experienced a distinct relief, cyanosis of the lips and face disappeared, the terrified expression changed to a smile, the pulse slowed down by 20-25 beats and showed a better dilatation, respiration dropped 45-40 to 25-20 per minute, pain, coughing and chest constriction ceased. In six cases however the effect was not obtained, for the reason that the (shock) process here was of irreversible character.

In cases of open pneumothorax (216 new cases and 62 cases of parting of sutures put in en route at previous points) we observed a considerable improvement of heart and lung action; subjectively all the patients noted an improvement in their general condition.

In 118 cases of haemothorax and pyothorax, the effect was not expressed so clearly as in the above cases, yet nonetheless a considerable improvement took place in the action of the heart and lungs, and also a subjective improvement in the condition of the patients.

In 105 cases, the nerve-block was repeated over two or three days time, until general improvement took place. We also used the block prophylactically in four cases (heart operations): two of these cases were in connection with purulent myocarditis; one involved removal of a foreign body from under the arch of the aorta. During these operations under local anaesthesia, the patients reacted very satisfactorily, even during those minutes when the heart was seized in the hand and brought out into the operative incision.

Under peace-time conditions we have used novocaine blocking of the stellate ganglion in two cases of thoracotomy. The block showed itself particularly effective in the second of these cases, where the patient had an anomly in the development of the parietal pleura, with a major defect of the pleuro-pericardial ligaments and a passage between the right and left pleural cavities; upon opening the left pleural cavity we had an extensive double pneumothorax, in spite of which the operation proceeded with the patients in a relatively satisfactory condition.

We have also employed blocking of the stellate ganglion in operations on the organs of the abdominal cavity. Under these conditions, the block (1) lowers cortical sensitivity and strengthens the effect of local anaesthesia (2) diminishes the oscillations in tone of the vascular walls and regulates the functioning of the

vasomotor and respiratory centers, thus making it possible to operate on even the most serious cases with the possibility of either primary or secondary shock eliminated.

CONCLUSIONS

1) Novocaine blocking of the sympathetic nerve system in the region of the stellate ganglion is a powerful therapeutic factor in pleuropulmonary shock, in chest wounds with open pneumothorax, in operations on the organs of the thoracic cavity and posterior mediastinum, and also on the organs of the abdominal cavity.

2) The technique of blocking the stellate ganglion as described above is the method of choice.

Erratum:- On page 3, line 10, change "dropped 45-40" to "dropped from 45-40".